THE WESTERN AUSTRALIAN
NATURALIST

Vol. 10 April 23, 1968 No. 8

CHROMODORIS QUADRICOLOR WESTRALIENSIS, A COMMON WESTERN AUSTRALIAN NUDIBRANCH

By ROBERT BURN, Hon. Associate in Conchology, National Museum of Victoria, Melbourne.

INTRODUCTION

A common dorid nudibranch of the west coast of Western Australia, formerly known as *Glossodoris westraliensis* has been little studied and its taxonomic status is uncertain. In this paper a reappraisal of the affinities of this nudibranch and its inclusion, as a subspecies, in a widely distributed Indo-Pacific species are discussed. Its geographic range and colour variation are also documented from a collection of nudibranchs belonging to the Western Australian Museum.

The writer is indebted to the Western Australian Museum, Perth, and the Australian Museum, Sydney, for the loan of the material reported upon here. Dr Barry Wilson and Mr Anthony Healy kindly provided the photographs. This research was carried out while the writer was in receipt of a grant from the Science and Industry Endowment Fund, C.S.I.R.O.

HISTORY AND STATUS

O'Donoghue (1924: 554) described *Glossodoris westraliensis* as a new species from the Abrolhos Islands (Houtmans Abrolhos) collections of the Percy Sladen Trust Expedition. A preserved specimen was illustrated in black and white and the radular teeth were figured. Allan (1950: 220, pl. 28, fig. 11) pictured the species in colour and added that it was "periodically common at Rottnest Island."

When describing *westraliensis* O'Donoghue (1924: 553) revived the genus *Glossodoris* Ehrenberg (1831) and relegated *Chromodoris* Alder and Hancock (1855) to the synonymy of the earlier name. This move was not justified. The type species of *Glossodoris, xantholeuca* Ehrenberg (1831) from the Red Sea, cannot be recognised from the description nor can it be identified with any known species from that area. A recent examination of the preserved holotype of *xantholeuca* in the Berlin Museum has revealed that the radula is no longer present within the specimen (N. Odhner, in E. and E. Marcus, 1960: 901). The absence of this organ makes it doubly hard to identify the species with any other.

As it is not possible to show any synonymy with identifiable genera or species *Glossodoris* must be set aside and *Chromodoris* restored to use. This has already been advoeated by Odhner (1957) and E. and E. Marcus (1960: 900).

Since Allan (1950), four references to the species have appeared in European literature. Pruvot-Fol (1951: 137, 158), in her monumental 'Revision' of the genus *Glossodoris*, suggested

that *westraliensis* was a synonym or subspecies of *Chromodoris quadricolor* (Ruppell and Leuckart, 1828), a long-known speeies of Indo-west Pacific distribution with well documented colour variation. She also perpetrated a curious geographical error in her paper when Long Island, one of the group known as the Abrolhos Islands or Houtman's Abrolhos, was identified with Long Island of New York fame in the north-west Atlantie. E. and E. Mareus (1960: 899) considered *westraliensis* identical with *quadricolor* and included its loealities among those of the latter. Engel and van Eeken (1962: 23) listed *westraliensis* among the synonyms of *quadricolor*, and a short time later, Engel and Nijssen-Meyer (1964: 30) listed the same synonymy but in more detail.

Details of the radula and anatomy, and the presence of orange, pale blue and blaek in the dorsal pattern, confirm that *westraliensis* and *quadricolor* are conspecific as first suggested by Pruvot-Fol (1951). However, Western Australian speeimens are very distinctively patterned and warrant sub-speeific recognition. The correct name for this subspecies must be *Chromodoris quadricolor westraliensis* (O'Donoghue, 1924).

DIAGNOSIS AND VARIATION

The following eolour characteristics are diagnostic for the subspecies *westraliensis:* (i) wide transverse bar of blaek across the middle of the dorsum, (ii) blue-green areas enclosed by blaek lines anterior and posterior to the tranverse bar, (iii) orange-red border of dorsum and similarly coloured rhinophores and gills, and (iv) two (rarely one) black lines along each side of the foot.

Large living specimens attain a length of 50 to 60 mm. Although the 32 examined specimens are consistent in respect to these diagnostic colour pattern charaeters, some variation has been observed. The variations are illustrated in Fig. 1.

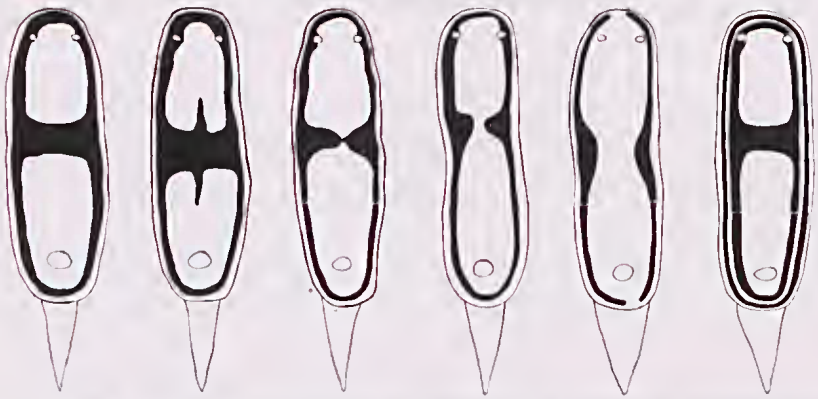

Fig. 1.—*C. q. westraliensis*, showing six pattern variations of the blaek pigment. The typical pattern is represented by the drawing on the left (based on 27 specimens examined). The next three drawings illustrate the patterns in three specimens eollected together at Rottnest Island, 1929. The seeond drawing from the right shows an ineomplete transverse pattern in a speeimen from Carnae I. On the extreme right is illustrated a specimen from Dorre I. with a double margin pattern.

The nominate subspeeies, *C. quadricolor quadricolor* (Ruppell and Leuckart, 1828) from the Red Sea, has a median line of black on the dorsum. Traces of a median line are present in one specimen from Rottnest Island (Fig. 1) and in another speeimen

from Cockburn Sound (Fig. 2), but as the transverse bar is both present and predominant, the specimens are referred to *C. q. westraliensis.*

Fig. 2—*C. q. westraliensis.* Two specimens collected by B. R. Wilson in May 1967 at Woodman Point, Cockburn Sound, W.A., from 10 feet on algal covered rock.

—Photo B. R. Wilson

DISTRIBUTION

C. q. westraliensis appears to be confined to the mid-west coast of Western Australia. In the Western Australian Museum collection it is represented by specimens from various localities between Dorre Island and Safety Bay. Mr. and Mrs. A. Leek of Melbourne have supplied me with a photograph of specimens from Quobba Point (north of Carnarvon) which represent the most northern record.

The vertical range is not extensive. Most specimens were collected from reefs or in pools; others were found from just below low tide level to about 10 feet. The single specimen from the southernmost locality, Safety Bay, came from 8-10 fathoms, probably on a craypot.

The localities from which specimens have been examined and the number of specimens from each locality are as follows: Dorre Island 2, Port Gregory 1, Horrocks Beach 7, Dongara 1, Scarborough 1, Rottnest Island (various parts) 18, Carnac Island 1, Safety Bay 1.

RECORDS OF *CHROMODORIS QUADRICOLOR QUADRICOLOR* FROM AUSTRALIA

At least two colour forms of *C. q. quadricolor* (Ruppell and Leuckart, 1828) are found in Queensland waters, where the subspecies has been misidentified as *Glossodoris westraliensis* (Mc-

Michael, 1956, 1957; Allan, 1957: 6; Gillett and McNeill, 1959: pl. 84, top left; Yaldwyn, 1963; 240, top left). Two Heron Island specimens demonstrate the great variation that occurs in the colour patterning. The specimen in Fig. 3 has the black pigmented areas significantly smaller than the blue and orange areas, while the specimen in Fig. 4 has this pattern reversed to such a degree that the living animal appears wholly black except for the orange border. This latter colour form is identical with a specimen described and figured from Zanzibar by Eliot (1904: 393, pl. 24, fig. 4) as *C. elizabethina africana*. *C. elizabethina* Bergh (1877) is an established synonym of *C. quadricolor*. Until it can be shown that the *africana* colour form is consistent, the name must be reduced to a synonym of *C. quadricolor*, too.

Fig. 3—*C. q. quadricolor*. Heron I., Queensland, October 1962.

—Photo Anthony Healy, Australian Museum Swain Reefs Expedition

In Queensland, *C. q. quadricolor* is found from low tide level down to 3-4 fathoms.

C. q. quadricolor has also been found at Barrow Island, northern Western Australia, where it was collected in an intertidal coral reef pool, 12 August 1966 (W.A.M. No. 2355-67). It is a new record for the State. The colour patterning of this single specimen is almost identical with the 22 mm. long specimen from near Djakarta, Indonesia, figured by Engel and Nijssen-Meyer (1964: 27, fig. 3).

At the present time, *C. q. quadricolor* is known in Australian seas by very few specimens. Its distribution appears to be confined to the tropical coastline.

SUMMARY

Two subspecies of the widespread and variable *Chromodoris quadricolor* (Ruppell and Leuckart, 1828) (Chromodoridinae: Nudibranchia) are recorded from Australia. *C. q. quadricolor*, with an encircling black band and median line, occurs in the

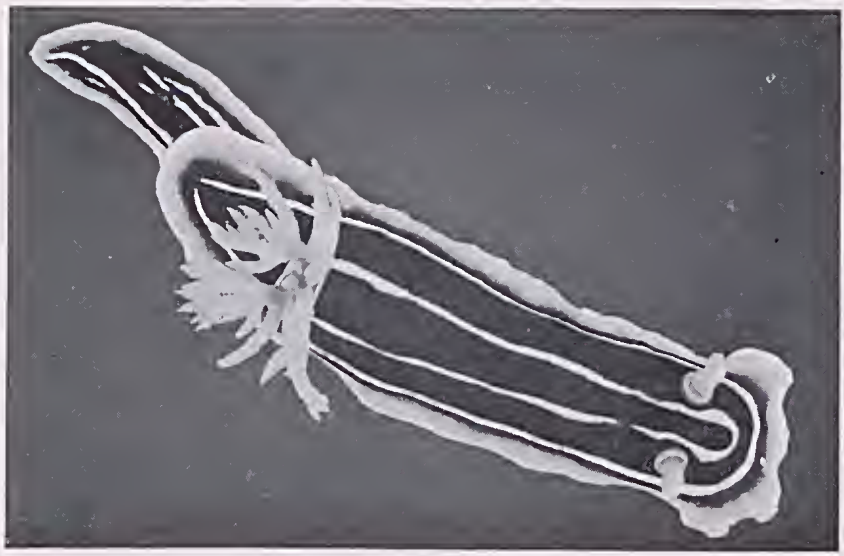

Fig. 4—*C. q. quadricolor*. The colour form *"africana,"* from Heron I., Queensland, October 1962.

—Photo Anthony Healy, Australian Museum Swain Reefs Expedition

southern parts of the Great Barrier Reef and in northern Western Australia. *C. q. westraliensis* (O'Donoghue, 1924), with a wide transverse black bar across the dorsum, is an isolated population occurring on the mid-west coast of Western Australia.

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BURROWING BY THE QUENDA, *ISOODON OBESULUS*

By JOHN A. W. KIRSCH, Department of Zoology, University of Western Australia, Nedlands.

In the Perth area the Short-nosed Bandicoot, or Quenda *(Isoodon obesulus)* is found throughout the Darling Range and on the sandy coastal plain. Within this range it is abundant in both the wetter streambank habitats and in the drier forested regions of the hills. The Quenda is an active animal, and its presence in the latter habitat raises the question of what physiological and behavioural adaptations bandicoots possess to counteract the heat and dryness of the summer months.

Many mammals dig burrows as heat refuges, but the Quenda typically builds a mound-like nest of grass and litter. I have observed released animals taking refuge under the skirt of needle-like leaves surrounding low-growing Blackboys, and inspection of a number of these trees in the Roleystone area revealed scratchings underneath which suggested that they were frequented by bandicoots. Additionally, Troughton (1965) suggests that Quendas may use burrows made by other animals, but states that they do not dig their own. Heinsohn (1966), in an ecological study of the Quenda and *Perameles gunni* in the vicinity of Smithton and Stanley, Tasmania, did not report burrowing by either species, although he states that the Quenda does dig deep vertical food-holes. Calaby (1966) did not observe burrows of the closely-related *Isoodon macrourus* in north-eastern New South Wales.

It was therefore of interest to observe that a captive female Quenda held in the University Zoology Department yards was engaged in burrowing. This activity commenced with the onset of century temperatures on 1st February, 1967, and in the course of nine days the animal dug four burrows as I purposely destroyed each one. A fifth was dug on 17th February, a day of high humidity and moderately warm temperature. Three of the five burrows opened South, one opened North, and the other faced the East. Since the yard, some 10 feet by 12 feet and floored with sandy soil, is well-shaded, the orientation of the entrances is probably of no importance.

All five burrows were of similar construction, being 10 to 12 inches in length and angled so that the deepest point was about 7 inches below the surface. An exception was the fifth burrow, which was 15 inches long and of a gentler slope. The plate shows the shape of a typical entrance hole, which was 4 to 6 inches wide.

(The photograph was taken at an angle: the ruler and litter are resting on level ground.) When the Quenda occupied a burrow, she usually curled up with only her back facing the entrance. On two occasions her female young one, independent of the pouch for one month, was found in the burrow with her.